AFIS Presentation and Overview of French organizations active in SoS
An AFIS point of view,
IEEE SoSE conference – 22 June 2018

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Disclaimer: There are many entities that are not mentioned here. This presentation is rather a sketch than a panorama.
French organization for Systems Engineering:

- Non profit organization, Affiliated member of INCOSE, Created in 1999
- Composed of **members** (companies, education and research) and **individual members**
- Comprising **8 technical committees**

**End of 2017:**
- **45 companies and education & research members**
- **> 900 individual members**

**Alain Roussel, President of AFIS**

http://www.afis.fr/pages/accueil.aspx

**Email:** afis@afis.fr

**Web Sites:**
- AFIS Community: http://afis.community/
Regional AFIS deployment in France

This deployment follows some objectives:

- To be closer to the both academics and industrial players
- To ease the involvement of our members to the AFIS activities
- To increase the Systems Engineering footprint through dissemination and collection of regional returns of experience

Progress of this local deployment:

- Mature: Occitanie Méditerranée Pyrénées, Nord-Est
- In progress: Rhône-Alpes, Nord-Est, Ile de France
- Just starting: Nouvelle Aquitaine, PACA
Some examples of systems performed by our Members

- Rail transportation
- Air transportation
- Automobile industry
- Urban transportation
- Land based Weapon Systems
- Combat aircraft
- Airspace surveillance
- Space systems
- Thermal power central
- Wind generator
- Hydro Generator
To promote SE by boosting: SE awareness, SE principles spreading, multidisciplinary approach, etc. in order to help delivering & support successful complex systems:

- **Foster SE approach** & use towards public & private companies and governmental organizations
- **Promote SE Education & Training** by actions towards University, Engineer Schools, Teachers & Professors, Research Labs,
- **Encourage Users exchanges**, enhance SE knowledge database, act to scale SE methodology & tools (various domains, various companies)
- **Participate** to enlarge the national & international visibility of SE Users, by providing relevant information

**Mastering Complex Systems is a major challenge for the our future**

AFIS aims to play a major role to develop and support S.E. extension, in order to increase collaboration between academicals and industrial actors, and to help companies to improve their position in a complex systems worldwide environment
8 Technical committees

1. **Competency and Training (CT FC : ctfc@afis.fr)**
   Develop a SE Competency framework, promote Certification process, organize ROBAFIS competition (promoted towards EMEA & INCOSE), support an education initiative related to SE & SysML towards High Schools, elaborate educational documents, propose SE career path and act to French Department of Education labeling
   Organization of an annual Academic & Industry Forum

2. **Global processes (CT PG : ctpg@afis.fr)**
   Analyze main SE processes with regards to the whole System Life Cycle activities: Requirements, architecture, development, Verification & Validation, Product-line Engineering
   Liaison with PMI : configuration & changes management, risk management, engineering management, Project management, etc..

3. **Safety, Validation and LSI (CT SV2S : ctsv2s@afis.fr)**
   Work subjects : Safety, maintainability, Verification & Validation, System qualification, System support

4. **Human Factors (CT FH : ctfh@afis.fr)**
   Identify & Analyze impact of Human Factors methodologies, how they interfere with system engineering, and how they are integrated in the Systems Life Cycle activities

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8 Technical committees

5. **SoS & services – Architecture (CT 3S–AI : ct3s-ai@afis.fr)**
   Promote best practices and adherence to new concepts for Services and System of Systems: Architecting principle (e.g. Architecture Frameworks) – Analyze impact of architecture of Services Engineering – Work on organizations and systems interoperability – Service Level Agreement.

6. **SE research & Innovation (CT RIIS : ctriis@afis.fr)**
   Detect & promote academic researches, identify mature SE research and their application, promote both academic and industrial research, participate to establish SE solid theoretical foundation, establish AFIS as a key player in SE Research field.

7. **System Engineering Management (CT MIS : ctmis@afis.fr)**
   Covering whole System Life Cycle, identify & promote methodology and tools supporting the management of System Engineering and the interaction with the Project Management. Propose solutions especially in the context of complex organizations dealing with multi SE teams.

8. **Model Based System Engineering (CT MBSE : ctmbse@afis.fr)**
   Promote and improve knowledge and competencies dealing with extensive use of models in the SE processes. Develop a common understanding of MBSE, promote use of System modeling (languages like SysML), identify the domain impact on models, support the standardization initiatives, collaborate with SoS CT for developing dedicated SoS modeling.
Books and guides : main pieces
(available on demand at afis@afis.fr)

L’ingénierie Système d’une Ligne de Produit (French)
Product-Line Engineering (*) (English)
(Elected INCOSE Product of year 2015)

Découvrir et comprendre l’ingénierie système (French)
[Discover and understand Systems Engineering]

Livre Blanc - Vision AFIS pour les années 2020-2025
[AFIS vision for 2020-2025] (French)

Introduction au penser Système (2014) (French)
[Systems thinking introduction]

Bonnnes pratiques en expression du besoin (2014) (French)
[User needs elicitation – best practices]

REGAL (Requirement Engineering), AFIS & - INCOSE Product (English)

Bonnnes pratiques en ingénierie des exigences (French)
[Requirement Engineering – Best practices]

Bonnnes pratiques en maîtrise des interfaces (French)
[Interfaces Engineering – Best practices] (English)

Bonnnes pratiques en prise de décision multilitères
[Muti-criteria decision – Best practices] (French)

(*) : available at: Google Play


Requirements and Architecture within Modelling Context,
published under the coordination of Raphaël Faudou (available on INCOSE bookstore)

Corpus d’introduction et de sensibilisation à l’IS,
under the coordination of Florence Lamberet and Daniel Prun
[Introduction to Systems Engineering]

Products Services Systems engineering: PSS chapter
published under the coordination of the 3SAI technical committee

Evolutions de l’ISO 15288 et couverture du CMMI,
créé par l’équipe CORNAC
(D. Cattan, I. Guivarch, E. Wetzel)
[Comparison between ISO 15288 and CMMI]
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AFIS Technical Committee 3S-AI

Areas of activity
- System of Systems Engineering (SoSE)
- Service Engineering
- Architecture and Architecture Frameworks
- Complex Systems engineering
- Lifecycles and engineering
- Sustainable systems engineering

Published products
- Glossary and data model for SoS
- Coupling component systems towards SoS, ICSSEA-2007, INCOSE 2008
- Tutorial on Complex Systems and SoS, 2009
- Services for SoS, definitions, 2010
- Organizational interoperability, CIGI-2011
- 2012-2014 (lifecycle management and societal responsibility)
- 2011, 2013, 2015 – Sustainable system engineering, 20 communications
- Service Engineering, INCOSE-2012
- Produits-Systèmes-Services (PSS) IPS2 2015
- Journal « Génie logiciel »: articles (2011 to 2016 editions)
- Poster Service Engineering, CSDM 2017

Coordinated by: André Ayoun and Claude Pourcel

~45 members

Working groups active in 2018
-[GI07] SoSE, collaborative engineering, multi-lifecycles, organizational issues.
-[GP14] Webinar on service engineering
-[GP16] System of services – operations – Service systems engineering
-[GI17] Analysis of webinars of INCOSE SoSEWG
-[GP19] Promotion of Service Engineering
-[GI21] From value chains to value networks

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Categories of organizations Working in System of Systems activities

1. Academia: Research and Training organizations (Univ, Schools, Research Centres)
2. Administrations and structured communities of users
3. Industrials: developing / implementing / operating SoS
4. Industrials: tools developers / vendors for SoS Engineering
SoSE in French Academic institutions

Universities
CNRS:
LABEX MS2T (SoSE)
LABEX SMART (smart Human Machine Interaction)
GdR MACS (Modelling, Analysis and Control-command of dynamic system)

Engineering schools:
Centrale Supélec, Arts et Métiers
ENSTA ParisTech
X-Mines-Telecom
Groupe ISAE SUPAÉRO, ENSMA, ESTACA, École de l’Air + Supméca
Groupe INSA: INSA Toulouse,....
Mines d’Ales, d’Albi
Univ. de Strasbourg, Univ de Lorraine,....

8 Institutes of Research and Technology (IRT):
SystemX (Paris Area)
Saint Exupéry (Bordeaux Area),....

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SoSE in French Academic institutions (AFIS Members)

Universities and schools
- Université de Lorraine
- IMT : Mines d’Alès
- INSA de Toulouse
- ISAE-Supaéro
- Grenoble INP
- Centrale Supélec
- ENAC Toulouse
- ENSTA ParisTech
- IPGP
- LAAS Toulouse
- UT Compiègne
- ENSTA Bretagne
- ENSTA ParisTech
- ESTIA
- CEA
- IRT SystemX
- IRT Saint Exupéry

Master in Complex Systems
- Université Paris Saclay
- Université de Lorraine
- Université de Bordeaux
- Université de Nantes
- Université Paris-Est Créteil
- Université de Technologie de Compiègne
- Université de Rennes – INSA de Rennes
- Université de Lyon
- Université d’Angers
- Université Savoie-Mont-Blanc
- Université Bretagne Sud- Université Catholique de l’Ouest- Université d’Angers
- Université de Toulon
- Université de Franche Comté
- INP Toulouse – INSA de Toulouse
- Institut Mines Telecom
- Université de Picardie
- Ecole Centrale Marseille
- INSA de Rouen
- Université de Technologie de Troyes

Networks
- GDR MACS (CNRS) : research in dynamic systems control-command and production systems
- AIP Primeca : coordinates pedagogic platforms

Master in Industrial Engineering
- Université de Strasbourg
- Université de St –Etienne - ENISE
- Université de Dunkerque
- Université Paris-Nanterre
- Ecole Centrale Lyon
- Ecole Centrale Nantes
- Grenoble INP – Université Grenoble Alpes
- INSA Toulouse
- Université d’Amiens
- Université d’Artois
- Université Paris-Est Marne la vallée
- Université Paris-Saclay
- UPEC
- ENI Metz
SoSE in French Administrations and communities of users

DGA (French MoD):
- Joint Command Information System (SIA)
- Federation of the Land Combat System (SCORPION)
- Future Combat Air System,…
- Naval Combat System
- Ballistic Missile Defence
- ➔ National and NATO systems

CNES
- Space systems of systems
- ➔ Cooperation with ESA

Smart cities
- Grand PARIS Transportation system of systems
- Grand LYON

Participation to European Programmes (FP7, H2020):
- **Air traffic Management** SESAR European Programme
- Rail : Shift2Rail
- Global navigation service Galileo
- Electric Networks interconnection
- Interconnection of fluvial systems
- T-AREA SoS, DANCE, COMPASS, Road2SoS,
- Road2CPS, Platforms4CPS
- Other: Police, Security,
- …

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SoSE addressed by French Industrials: developing / implementing / operating SoS

- **AREVA, FRAMATOME**: nuclear plant systems
- **AIRBUS**: Civilian (Satellite constellations) and Military SoS (border surveillance, tactical networks)
- **ArianeGroup**: Launch services
- **Atos**: signalling and control for rail systems, Schengen
- **Cap Gemini**: Rail, Naval, Cyber…
- **C-S & Sopra**: Military Joint Information systems
- **ENEDIS + EDF / RTE**: Electric Power (co)generation, distribution, management
- **NAVAL GROUP**: Military and Civilian Naval systems (e.g. Maritime surveillance; Search and rescue)
- **RENAULT**: Automotive industry, connected cars
- **Thales**: Civilian (Air Traffic Control, smart cities, railway signalling, …) and Military SoS (Air Operations, Ballistic Missile Defence)
- **SAFRAN**: Information systems for police and firemen
- **TECHNIP FMC**: Oil industry
- **…**
SoSE addressed by French Industrials: tools developers / vendors for SoS Engineering

- **All4Tech**: MBSE MBSA tools, Safety Architect
- **ARTAL**: Capella* architecture modelling tool, CITRUS (IVV management)
- **Dassault Systems**: 3D Experience suite (acquired **NoMagic**: Cameo)
- **ESI Group**: Virtual twins
- **Geeglee**: Architecture exploration / comparison tool,
- **Knowledge Inside**: arKtect
- **MEGA**: Architecture modelling tool (MEGA_suite_for_NAF)
- **Obeo**: Capella distribution (developed by the “clarity” community)
- **Sodius**: MDWorkbench, SE Collab

+ French subsidiaries of International Companies:
  - **APSYS**: SIMFIA (safety analysis tool)

And many more...

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Areas addressed by French organizations

- Issue of Specification
- System of Systems Engineering
- Service Engineering
- P,M,T, collaborative SE...
- Products Systems Services
- Strategic management
- Cyber Physical Systems
- Business models
- Issue of Integration
- Issue of being only reactive
- Issue of Validation / revalidation
- Issue of not in Time-to-Market